

Patent Claims

1. Apparatus for preparing a solution of a solid with a liquid and/or a dilution of a liquid with another liquid, comprising:
 - 5 a balance that has a weighing pan, a display- and operating unit, a processor, a storage memory, and a data interface; and
 - at least one electronic dosage delivery device for liquids, the device being equipped with a microprocessor, a memory unit, and a data interface, wherein a communication can be established between
 - 10 the data interface of the balance and the data interface of the at least one electronic dosage delivery device, wherein the electronic dosage delivery device has an identifier element that signals when the electronic dosage delivery device has been selected, and wherein a program is executable in the balance for preparing a solution of a solid
 - 15 with a liquid and/or a dilution of a liquid in another liquid, said program being configured for performing calculations in the processor of the balance based on instructions input by an attendant, also based on substance data stored in the memory of the balance and in certain cases based on weighing results, said program being further
 - 20 configured for selecting a dosage delivery device from an available selection and setting the dosage delivery device for the liquid volume that is to be taken in and/or dispensed.

2. Apparatus according to claim 1, wherein a code reader is connected for communication with the balance, said code reader serving at least in part for entering data, and for identifying chemicals to be used.
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3. Apparatus according to claim 1, comprising:
a recording device configured as an activity log printer and/or a label printer interfaced with the balance.
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4. Apparatus according to claim 1, wherein the storage memory of the balance comprises a database.
5. Apparatus according to claim 4, wherein the database holds substance data and/or substance parameters and/or work procedures.
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6. Apparatus according to one of the claim 1, wherein the balance is interfaced for communication with a laboratory information management system.

7. Apparatus according to claim 1, wherein the balance is interfaced with a data-processing system configured as a personal computer or a palmtop computer.
- 5 8. Apparatus according to claim 1, wherein the balance is interfaced with a computer in a computer network.
9. Apparatus according to claim 6, wherein a database resides in the laboratory information management system, and wherein
10 substance data and/or substance parameters and/or work procedures are stored in the database.
10. Method for preparing a solution of a solid with a liquid and/or a dilution of a liquid with another liquid, wherein the method includes:
15 connecting a balance that has a display- and operating unit, a processor, a storage memory, and a data interface with at least one electronic dosage delivery device for liquids, the device being equipped with a microprocessor, a memory unit, a data interface, and an identifier element, wherein the balance and the at least one electronic
20 dosage delivery device can communicate with each other through their respective data interfaces, and wherein a program in the processor of the balance:

performs calculations based on instructions given by the attendant, also based on substance data stored in the memory of the balance and in certain cases based on weighing results;

5 wherein said program selects a dosage delivery device from an available selection, sets the dosage delivery device for the liquid volume that is to be taken in and/or dispensed; and

activates the identifier element of a selected electronic dosage delivery device.

10 11. Method according to claim 10, wherein entry of instructions and confirmations by the attendant are performed using the display- and operating unit of the balance.

12. Method according to claim 10, wherein a database is available
15 and wherein the balance which controls the dosage delivery device calls up work instructions, substance data and/or substance parameters from the database.

13. Method according to claim 10, wherein the balance measures
20 a weight of a completed solution and/or dilution, and wherein a

completed process of making a solution and/or dilution is subjected to a plausibility check.

14. Method according to claim 13, wherein a temperature of the solution is measured and used as an input parameter in calculations for the plausibility check.
15. Method according to claim 10, wherein a recording device is available and interfaced to the balance, and wherein said recording device generates an activity log of a completed and/or prematurely terminated preparation of a solution of a solid with a liquid and/or a dilution of a liquid with a further liquid.
16. Method according to claim 10, wherein a code reader is available and interfaced for communication with the balance, and wherein the code reader serves to scan data for use in the program.
17. Method according to claim 10, comprising the following method performed by the attendant:
 - selecting and obtaining chemicals for the solution and/or dilution to be prepared;

- calling up a work instruction on the display- and operating unit of the balance;
- calling up substance parameters on the display- and operating unit of the balance;
- 5 ▪ entering a targeted concentration of the solution and/or dilution on the display- and operating unit of the balance;
- entering a targeted volume of the solution and/or dilution on the display- and operating unit of the balance;
- 10 ▪ calling up a calculation routine on the display- and operating unit of the balance for a first substance to be weighed in;
- weighing a first substance into a container on the weighing pan;
- taking up a second substance using a dosage delivery device that has been selected and preset by the program and identified through a signal;
- 15 ▪ delivering a volume that has been set on the dosage delivery device into the container that is sitting on the balance pan and contains the first substance; and
- entering a command for generating an activity log on the display- and operating unit of the balance.

18. Method according to claim 10, wherein a work procedure is freely configurable.
19. Method according to claim 10, wherein the balance is
5 interfaced with a data-processing system and/or a computer in a computer network and/or a laboratory information management system whose respective memory is accessed by the balance to call up substance data and/or substance parameters for a solution that is currently to be prepared of a solid with a liquid and/or a dilution that is
10 currently to be prepared of a liquid with another liquid, and to enter said substance data and/or substance parameters in the storage memory of the balance for use in calculations required under a current work procedure.
- 15 20. Method according to claim 19, wherein the data as well as an activity log of a completed solution- or dilution procedure are stored in a laboratory information management system, from which the data and/or the activity log are available for further use.
- 20 21. Program which can be executed in an apparatus according to claim 1, wherein the program performs a work procedure selected by an attendant for preparing a solution of a solid with a liquid and/or a

dilution of a liquid with another liquid, wherein the program is performed to perform calculations based on instructions entered by the attendant, based on substance data stored in the memory of the balance, and in some cases based on obtained weighing results, and wherein the program is configured to select a dosage delivery device from an available selection, set the dosage delivery device for the liquid volume that is to be taken in and/or dispensed, and wherein the program is configured to activate the identifier element of the selected electronic dosage delivery device.

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22. Program according to claim 21, wherein the program is configured to perform the following operations under a method according to claim 10:

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- converting a target concentration for a solution or a dilution from an entered unit of measure to a desired unit of measure compatible with the substance data and substance parameters;
- calculating an amount of liquid required for preparing a solution or dilution based on the weight of a first substance that has been measured with a balance;
- selecting a suitable electronic dosage delivery device and identifying the selected device;

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- setting the selected electronic dosage delivery device for a volume dose to be taken in and/or dispensed;
 - displaying a total weight and/or additional parameters in the display- and operating unit of the balance;
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- after a second substance has been added, comparing its mass to the calculated values based on a volume that was set in the dosage delivery device and based on the stored density value, wherein the calculation takes temperature into account, for a gravimetric verification check of a completed solution;
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- providing an indication of plausibility that a desired solution has been produced within a predefined tolerance window relative to a target volume and/or a target concentration; and
 - generating a log record of the parameter settings and measured data.
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23. Apparatus according to claim 7, wherein a database resides in the data processing system, and wherein substance data and/or substance parameters and/or work procedures are stored in the database.

24. Apparatus according to claim 8, wherein a database resides in the computer network, and wherein substance data and/or substance parameters and/or work procedures are stored in the database.
- 5 25. Apparatus according to claim 1, wherein the electronic dosage delivery device is configured as an electronic pipette.
26. Method according to claim 10, wherein the electronic dosage delivery device is configured as an electronic pipette.